SharpEye™

Mini Flame Detectors

UV/IR - Model 20/20ML
&
UV - Model 20/20MU

User and Maintenance Manual

TM 767100, Rev. A, April 2005

20/20MU (Plastic Housing)

20/20ML (St.St Houdsing)

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Warning:

This manual should be carefully read by all individuals who have or will have responsibility for using, maintaining or servicing the product.

The Detector is not field-repairable due to the meticulous alignment and calibration of the sensors and the respective circuits. Do not attempt to modify or repair the internal circuits or change their settings, as this will impair the system's performance and void the Spectrex, Inc. Product warranty.

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1. Scope

1.1 Product Overview

The Spectrex Model 20/20ML UV/IR and 20/20MU UV Flame Detectors are designed to sense the occurrence of fire and flames and subsequently activate an alarm or an extinguishing system, directly or through a control circuit for maximum fire protection. They use the innovative technology of advanced digital signal processing to analyze the dynamic characteristics of fire.

Detection performance is controlled by a microprocessor and easily adapted to all environments, applications and requirements.

These versions of the UV/IR and UV detectors are designed for location in non-Ex / safe areas. The programmable functions are available through a RS-485 port used with a standard PC and software supplied by Spectrex.

To use the HOST software and to change the required functions, refer to manual TM784050 for instructions.

1.2 Document Overview

This manual describes the detector and its features and provides instructions on the installation, operation and maintenance.

This manual is divided into separate Sections as follows:

Section 1. **Scope** - a general introduction and overview of the product and the Manual, with a brief description of its content.

Section 2. **Technical Description** - the detector's theory of operation.
Section 3. **Performance** - the detector features and capabilities.
Section 4. **Operation** - the detector's operation modes, user interface and indications.
Section 5. **Technical Specifications** - the Detector's electrical, mechanical and environmental specifications.
Section 6. **Installation Instructions**, including wiring and mode setting.
Section 7. **Operating Instructions** and power-up procedures.
Section 8. **Maintenance Instructions** and support procedures.
Appendix A. **Typical Wiring Configurations** - wiring diagrams for installation.
Appendix B. **Long Range IR Fire Simulator**
Appendix C. **Ordering information**

2. Technical Description

- **Detection Range**: up to 50 ft (15m) for a 1 ft^2 (0.1m^2) fire.
- **Two Response Levels**: Warning & Detection.
- **Solar Blind**
- **Microprocessor Based**: Digital signal processing.
- **Built In Test (BIT)**: Manual and Automatic (see section. 4.4).
- **Electrical Interface**:
    - Dry contact relays
    - Communication network RS-485
    - 4-20mA output

2.1 Principles Of Operation

20/20ML
The Model 20/20ML UV/IR Flame Detector is an electronic device designed to sense the occurrence of fire and flames and subsequently activate an alarm or an extinguishing system directly or through a control circuit.

The UV-IR Radiation Flame Detector is a dual spectrum optical detector sensitive to two separate ranges of the radiation spectrum, both of which are present in fires. The detector monitors the protected area, by measuring the radiation intensity in it, within two frequencies ranges of the electromagnetic spectrum, namely the Ultra-Violet (UV) and the Infra-Red (IR).

The detector integrates two dependent channels in which appropriate detection pulses are registered and further analyzed for frequency, intensity and duration.

20/20MU
The Model 20/20MU UV Flame Detector is an electronic device designed to sense the occurrence of fire and flames and subsequently activate an alarm or an extinguishing system directly or through a control circuit.

The UV Flame Detector is a single spectrum optical detector sensitive to the UV radiation spectrum, which is present in fires. The detector monitors the protected area, by measuring the radiation intensity and the frequency range of the electromagnetic spectrum, namely the UV.

The detector senses one channel in which appropriate detection pulses are registered and further analyzed for frequency, intensity and duration.

2.2 Sensing Elements

20/20ML
The IR sensor is sensitive to radiation over the range of 2.5-3.0 micron.

The IR channel will register a detection signal, at the appropriate level, when the IR sensor is exposed to radiation in the appropriate frequency range, having an intermittent gleam pattern characteristic to flickering-fire, and when a preset threshold and time duration are reached.

The UV sensor is sensitive to radiation over the range of 0.185-0.260 micron. The UV channel incorporates a special logic circuit that eliminates false alarms caused by solar radiation and other non-fire UV sources. Furthermore, the UV channel sensitivity is stabilized over the working temperature range.

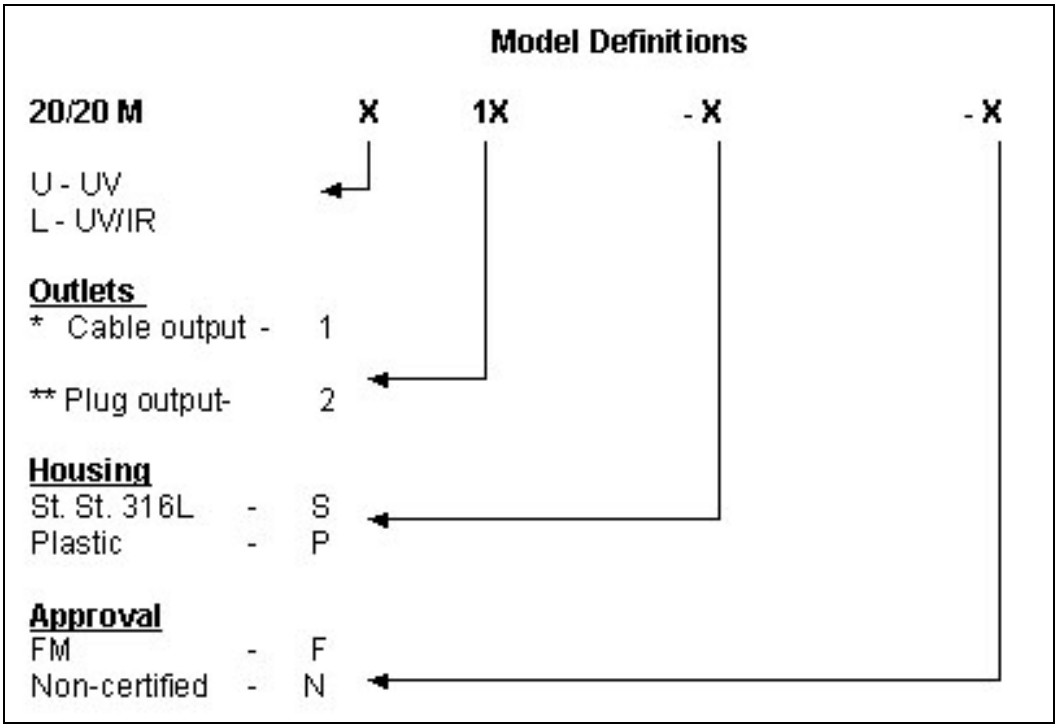
20/20MU
The UV sensor is sensitive to radiation over the range of 0.185-0.260 micron. The UV channel incorporates a special logic circuit that eliminates false alarms caused by solar radiation and other non-fire UV sources. Furthermore, the UV channel sensitivity is stabilized over the working temperature range.

2.3 Modbus RS-485

For more advanced communication 20/20ML and 20/20MU has a RS 485 modbus Compatible output that provides Data communication from a network (up to 247 detectors) to a host computer on universal controller for central monitoring.
This feature enables reconfiguration of factory settings, eases maintenance and allows local and remote diagnostics.

2.4 Types and Models

The 20/20ML and 20/20MU have two (2) housing options: St. St. 316L, and plastic.
The output is via either a connector (socket) or a cable tail (up to 2m long).



** Mating plug supplied with detector
FM – Functional Tests

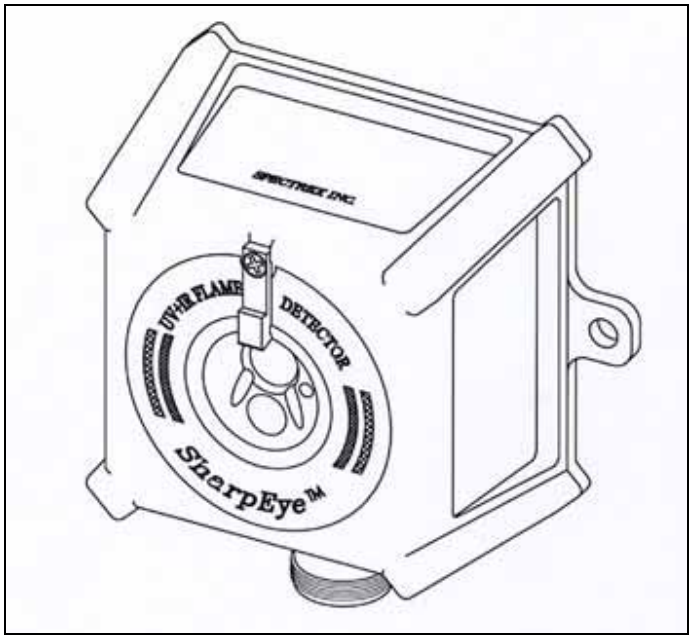


Figure 1: UV/IR Flame Detector

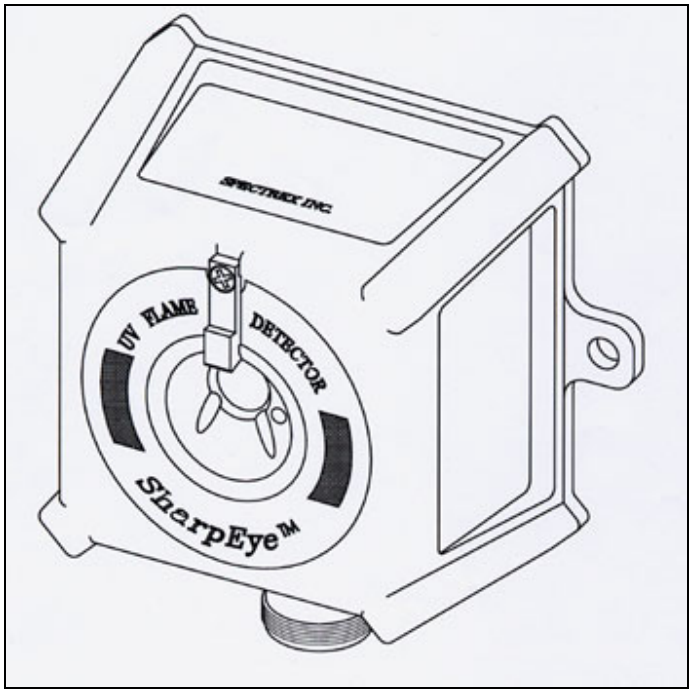


Figure 2: UV Flame Detector

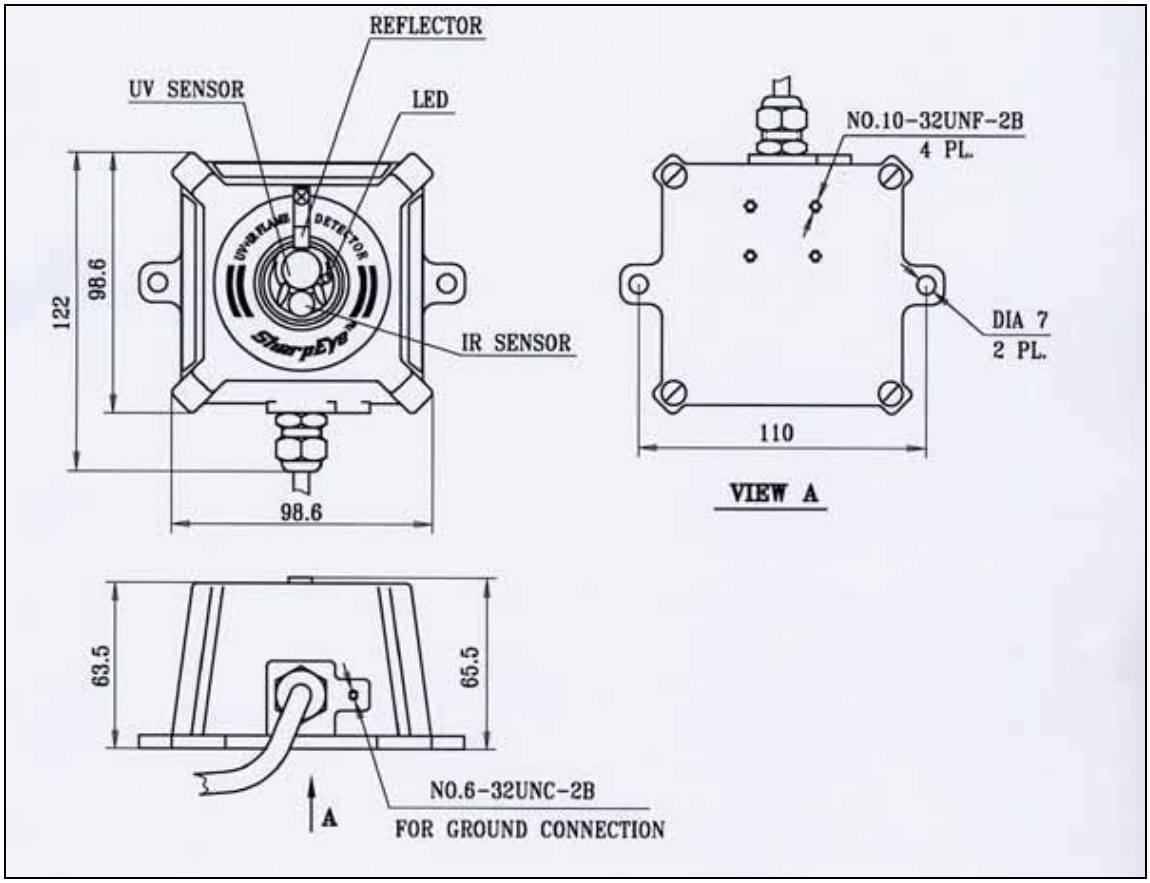


Figure 3: Flame Detector Assembly - Outline Drawing - Cable output option

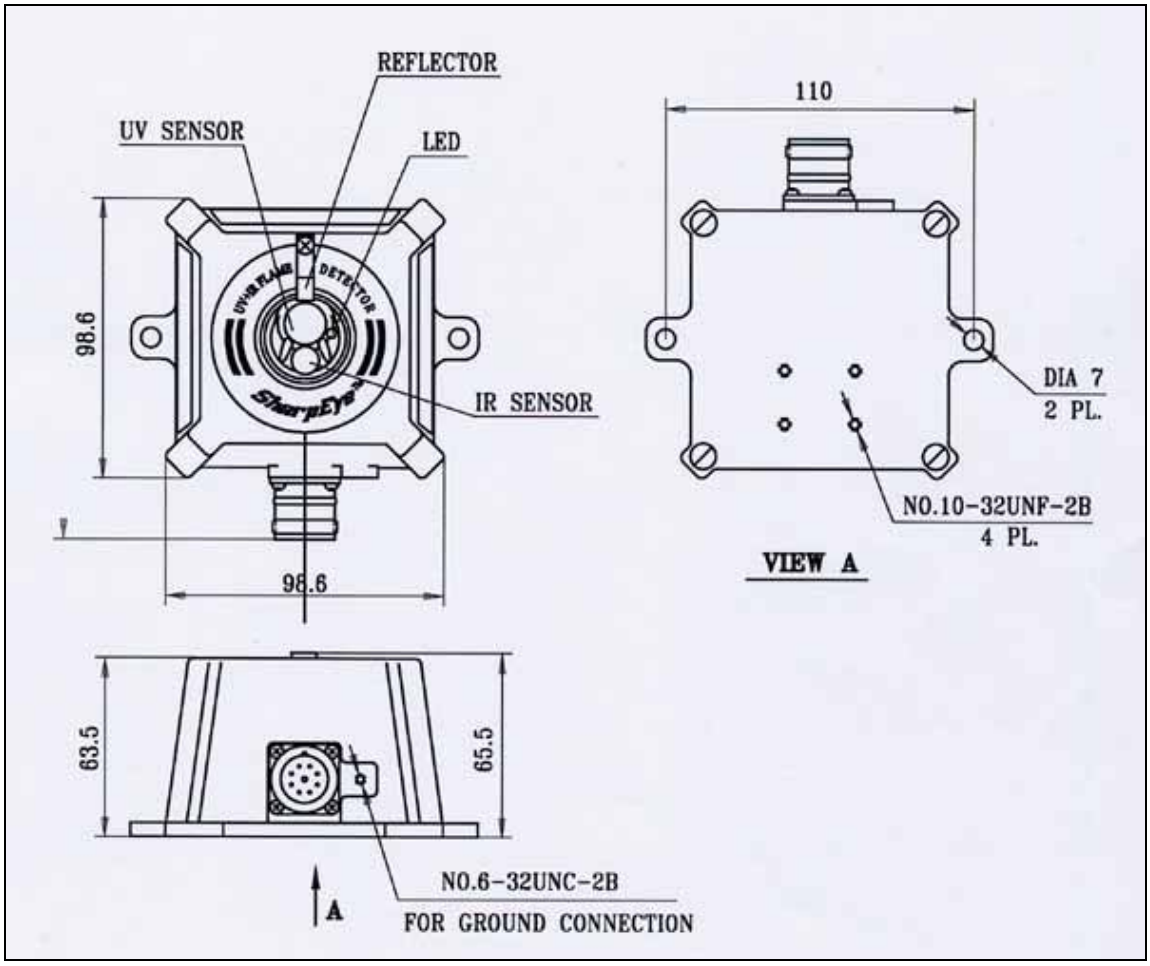


Figure 4: Flame Detector Assembly - Outline Drawing - Connector output option

3. Performance

3.1 Detection Sensitivity

Detection sensitivity is the maximum distance at which the detector will reliably detect a specific size of fire & typical type of fuel (standard fire).

Standard Fire:
A 1ft^2 (0.1m^2) Gasoline pan fire with max. wind speed of 6.5 ft/sec (2 m/sec).

Sensitivity Ranges:
The detector has two user selectable sensitivity ranges. For each range there are two response levels.

1. WARNING (Pre-alarm)
2. ALARM

The detection distance, for the WARNING level, is approximately 10% higher than the ALARM distance. Alarm response times for a “standard fire” at a specified range are shown hereunder.

Sensitivity Range – ft (m)	50 (15)
Response Time (sec)	5

For some typical ambient conditions the Zeta parameter as defined in NFPA 72 for the detector 20/20ML is 0.01 (1/meter) and 20/20MU is 0.0003 (1/meter).

Note:
Zeta parameters may vary significantly with changes in temp, air pressure, humidity, visibility conditions, etc.

Other fuels
The detector will react to other types of fires as follows:

Pan Fire Size: 1ft^2 (0.1m^2)

Maximum Wind Speed: 6.5 ft/sec (2 m/sec)

Maximum Response Time: 10 sec

Table 1: Response Sensitivity Ranges for other fuels

		% Of Max. Distance	
Type Of Fuel	Fire size	**20/20ML**	**20/20MU**
Gasoline	1ft^2 (0.1m^2) pan fire	100	100
n-Heptane		100	100
Diesel Fuel		75	75
JP5		75	75
Kerosene		75	75
Alcohol (Ethanol)		50	75
IPA (Isopropyl Alcohol)		50	50
Methanol		50	50
Methane	20" (0.5 m) Plume fire	30	80
LPG (Propane)		30	80
Hydrogen		30	100
Silane	12" (0.3 m) Plume fire	30	60
Polypropylene Pellets	8" (0.2 m) Dianeter	30	40
Office Paper	1ft^2 (0.1m^2) pan fire	25	40

3.2 Cone Of Vision

Horizontal: 100°
Vertical: 100°

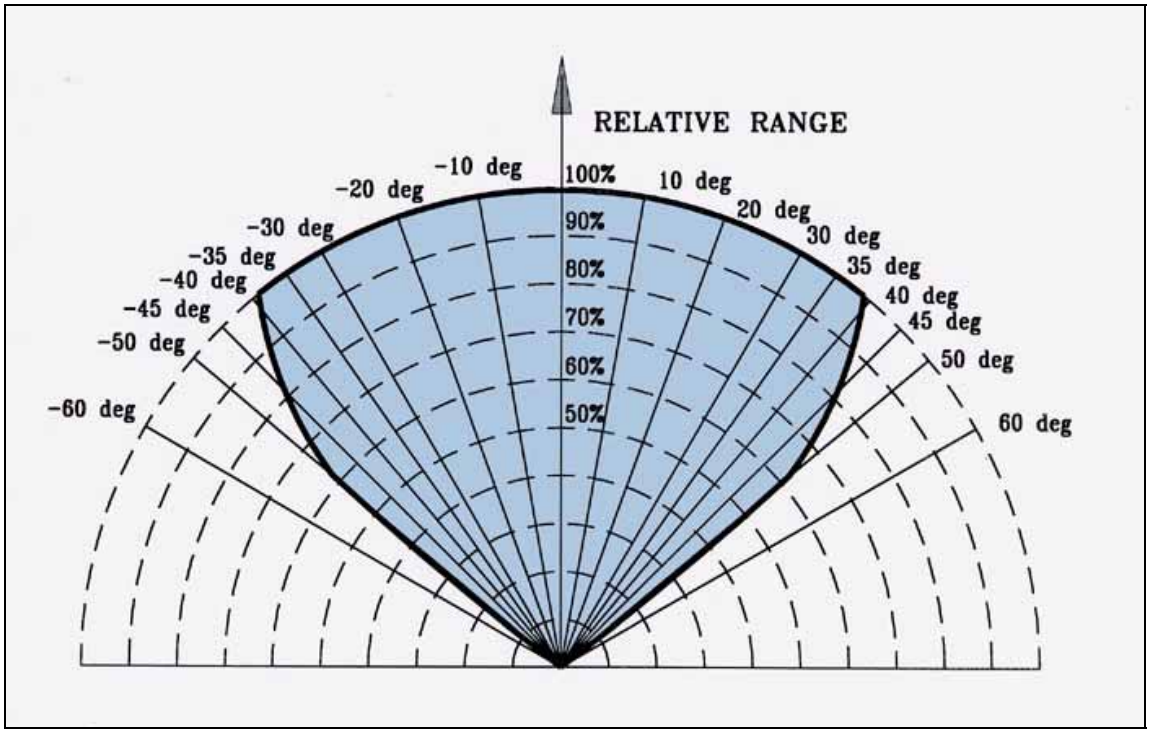


Figure 5: Horizontal and Vertical Fields of View

3.3 False Alarms Prevention

The detector will not provide an alarm or a warning signal as a reaction to the radiation sources specified below.
False alarm immunity is listed in
- Table 2 for the 20/20 ML UV/IR detector
- Table 3 for the 20/20 MU UV detector

Notes:
IAD = Immune at Any Distance.
All sources are chopped from 0 to 20Hz.

Table 2. 20/20ML - Immunity to False Alarm Faults

Radiation Source	Immunity Distance ft. (m)
Sunlight	IAD
Indirect or reflected sunlight	IAD
Vehicle headlights (low beam) conforming to MS53023-1	IAD
Incandescent frosted glass light, 100W	IAD
Incandescent clear glass light, rough service, 100W	IAD
Fluorescent light with white enamel reflector, standard office or shop, 40W (or two 20W)	IAD
Arc welding [4mm (5/32in) rod; 240A]	9.8ft (3m)
Bright colored clothing, including red and safety orange	IAD
Electronic flash (180 watt seconds minimum output)	IAD
Red dome light conforming to M251073-1	IAD
Blue-green dome light conforming to M251073-1	IAD
Flashlight (Mx 991/U)	IAD
Radiation heater, 1500W	IAD
Radiation heater, 1000W with fan	IAD
Grinding metal	3.3ft (1m)
Lit cigar or cigarette	IAD
Match, wood, stick including flare up	3.3ft (1m)

Table 3. 20/20MU - Immunity to False Alarm Faults

Radiation Source	Immunity Distance ft. (m)
Sunlight	IAD
Indirect or reflected sunlight	IAD
Vehicle headlights (low beam) conforming to MS53023-1	IAD
Incandescent frosted glass light, 100W	IAD
Incandescent clear glass light, rough service, 100W	IAD
Fluorescent light with white enamel reflector, standard office or shop, 40W (or two 20W)	IAD
Bright colored clothing, including red and safety orange	IAD
Red dome light conforming to M251073-1	IAD
Blue-green dome light conforming to M251073-1	IAD
Flashlight (Mx 991/U)	IAD
Radiation heater, 1500W	IAD
Radiation heater, 1000W with fan	IAD
Lit cigar or cigarette	5ft. (1.5m)
Match, wood, stick including flare up	13.3ft. (4.0m)

Please Note: UV flame detectors are sensitive to false alarm from UV radiation sources such transforms, motors, welding, spikes, etc. (That may be present in the protected area or far away.)

4. Operation

4.1 Visual Indications

One 3-color LED-indicator is located in the detector front window:

Detector Status	LED color	LED mode
Fault, BIT Fault	Yellow	4 Hz flashing
Normal	Green	1 Hz flashing
Warning	Red	2 Hz flashing
Alarm	Red	Steady

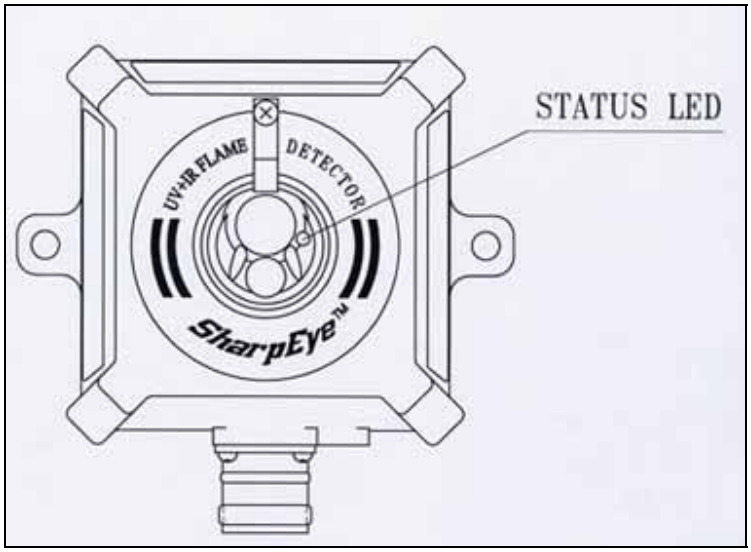


Figure 6: 20/20ML LED

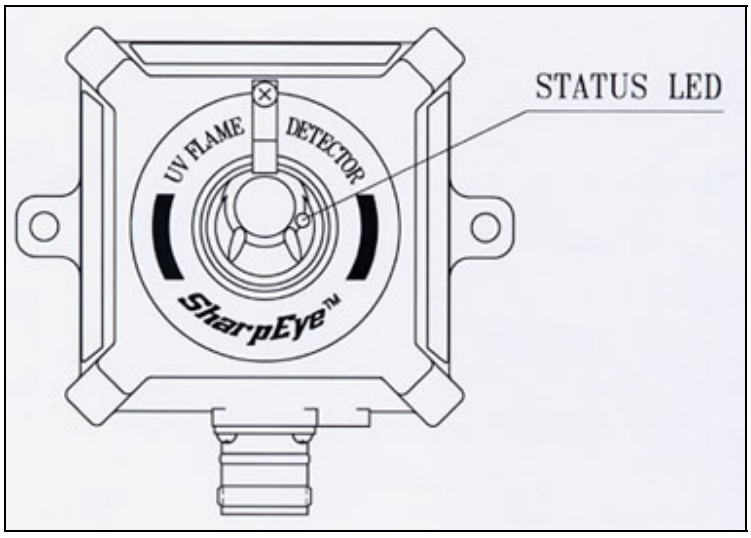


Figure 7: 20/20MU LED

4.2 Output Signals

The detector provides the following outputs:

- Alarm relay
- Fault relay
- 4-20mA current output
- RS-485 communication

The detector can be in one of the following states.

Normal:	The detector is functioning normally.
BIT:	The detector performs a Built In Test.
Warning:	Fire detected – warming alarm (pre-alarm) state
Alarm:	Fire detected – fire alarm state
Latched Alarm (Optional)	The alarm outputs are latched due to the detection of a fire that has already been extinguished.
BIT Fault:	A fault is detected during BIT sequence. The detector will continue to detect fire if the alarm conditions occur.
Fault:	A fault is detected when the power supply is too low or during a software fault.

In each state, the detector will activate different outputs as specified in table 4.

Table 4: Output Signals versus Detector State

Detector State	Color LED	Flashing LED	Alarm Relay	Fault Relay	4-20mA Output
Normal	Green	1 Hz	Off	On	4 mA
Warning	Red	2 Hz	Off	On	16 mA
Alarm (1)	Red	Steady	On	On	20 mA
Latch(2)	Red	Steady	On	On	20 mA
BIT Fault(3)	Yellow	4 Hz	Off	Off	2 mA
Warning at BIT Fault	Red	2 Hz	Off	Off	16 mA
Alarm at BIT Fault	Red	Steady	On	Off	20 mA
Fault	Yellow	4 Hz	Off	Off	0 mA

Notes:

1 The alarm outputs will be activated as long as the alarm conditions are present
2 The Alarm state can be latched (optional) according to programmable function
3 The detector will be in its BIT FAULT state until it has passed a successful BIT and will stop approximately 3 seconds after the fire is no longer detected.

4.2.1 Optional latching

The detector has an optional latched alarm output capability, which operates according to the programmable function. If selected, upon the detection of a fire, the detection signal is latched until manually reset (disconnecting the power supply or performing a manual BIT). Latching affects the ALARM RELAY, 4-20mA output, the ALARM LED.

4.2.2 Built-In-Test

When the programmable function “Alarm BIT” at YES, successful Manual BIT will activate the alarm relay for 3 sec. and the 4-20mA output will provide 20mA for 3 sec.

4.3 Detector Mode Setup

4.3.1 Detector setting

See Section 4.3.3 for default factory settings

The 20/20ML and 20/20MU incorporates several functions that can be set by the customer using Spectrex Host software, which will be supplied for each detector shipment

The Host software enables you to change functions as described in 4.3.2. Refer to manual TM 784050 for programming instructions.

4.3.2 Detector’s various functions

a. Sensitivity Ranges

The detector offers two (2) sensitivity settings. The settings refer to the gasoline fire of 1ft^2 from

b. Alarm Delay

The detector is equipped with an Alarm Delay option, which provides programmable time delays of 0 to 30 seconds with eight (8) fixed settings: 0, anti-flare, 3, 5, 10, 15, 20, and 30 seconds.

The Alarm delay option will affect the alarm relay and the 4-20mA output

When an Alarm (Detection) level condition is encountered, the detector delays the execution of the Alarm output relay by the specified period of time. The detector will then evaluate the condition for 3 seconds. If the Alarm level is still present, the Alarm outputs will be activated. If this condition no longer exists, the detector will return to its standby state.. The LED will indicate warning level during the delay time only if the fire condition exists.

Anti Flare

Anti Flare mode is selected to prevent false alarm in locations where fast flares may be present. The Time delay for fire alarm in this mode is from 2.5 to 15 seconds (mostly less than 10 seconds).

Table 5: Time Delay

Delay (seconds)
0
*A – anti-flare
3
5
10
15
20
30

* Default

c. Function Setup

The user can select the desired mode of operation by means of host.

Table 6: Function Setup

	Name	Yes	No
1	Alarm Latch	Alarm latching enable	Alarm latching disable **(default)**
2	Automatic BIT	Automatic & manual BIT **(default)**	Manual BIT only
3	Alarm BIT	Successful Manual BIT activates the Alarm Relay for approximately 3 seconds; the 4-20mA will provide 20mA for 3 sec	Successful manual BIT does not activate the Alarm Relay **(default)**

d. Addresses Setup

Refer to TM 784050 for instructions for defining the addresses of the detectors. The detector provides up to 247 addresses (from 1 to 247) that can be used with RS-485 communication link.

4.3.3 Detector Default Set Up

The detector has five (5) functions that can be programmed according to customer requirement at factory or at customer facility using software Host. The standard set up (default) that the detector is programmed to if there are no specific requirements are as follows:

Table 7: Default function set up

Detector default set up:	20/20ML	20/20MU
Delay	A	3
Alarm Latch	NO	NO
Automatic BIT	YES	YES
Alarm BIT	NO	NO

4.4 Built In Test

4.4.1 General

The detectors' Built In Test (BIT) checks the following:

- Electronics circuitry
- Sensors
- Window cleanliness

The detector can be set to perform the BIT automatically and manually or manually only.

4.4.2 Principles

If the result of a BIT is the same as the current status of the detector (NORMAL or BIT FAULT), the detector's status is unchanged. If the result of a BIT differs from the current status of the detector, the detectors' status is changed (from NORMAL to BIT FAULT or from BIT FAULT to NORMAL).

Note: In BIT FAULT status, the detector can continue to detect a fire.

4.4.3 Automatic & Manual BIT

Manual Bit

Functions as described in section 4.4.4. In the case of an unsuccessful BIT all outputs will function as described in section 4.4.4.but the BIT will be automatically executed every 1 minute. This mode of operation will continue until successful BIT has been encountered. As a result, the detector will resume its normal operation.

Automatic BIT

The detector automatically performs a BIT every 15 minutes.
A successful BIT does not activate any indicator.

- The FAULT relay remains CLOSED (NORMAL).
- The LED continues to flash (1 Hz) at green.
- The 4-20mA output continues to indicate 4 mA.

An unsuccessful BIT sequence activates the following:

- The FAULT relay is opened.
- 4-20mA output indicates BIT FAULT (2 mA).
- The LED flashes (4 Hz) at yellow.
- BIT procedure will be performed every 1 minute.

4.4.4 Manual BIT only

The BIT is initiated manually by momentarily connecting PIN No. 3 (or yellow wire) with PIN No. 2 (or black wire). A successful manual BIT activates the following:

- FAULT relay remains CLOSED.
- ALARM relay is activated for 3 sec (only when Function Alarm BIT at YES)
- 4-20 mA OUTPUT current will be 20mA (only when Function Alarm BIT at YES).
- The LED will illuminate at red for 3 sec.

Unsuccessful BIT activates the following:

- FAULT relay is opened.
- 4-20 mA output indicates BIT FAULT condition (2mA).
- The LED flashes (4 Hz) at yellow.

Note: During a MANUAL BIT, if Function Alarm BIT is in YES position, the ALARM relay will be activated and the 4-20mA outputs will initiate 20mA. Therefore, automatic extinguishing systems or any external devices that should be activated under actual alarm conditions should be disconnected during BIT.

5.Technical Specifications

5.1 Electrical Specifications

A. **Operating Voltage**: 18-32 VDC
B. **Power Consumption**:
Max. 35mA in Stand-by
Max. 80mA in Alarm
C. **Electric input protection**: The input circuit is protected against voltage-reversed polarity, voltage transients, surges and spikes according to MIL-STD-1275A.

D. **Electrical outputs**

- ***Dry Contact Relays****:*

Table 8: Contact Ratings

Relay Name	Type	Normal position	Maximum Ratings
Alarm	SPST	N.O.	2A at 30VDC or 0.5A at 250 VAC
Fault *	SPST	N.C.	2A at 30VDC or 0.5A at 250 VAC

** The FAULT relay will be normally energized closed during normal operation of the detector. The contact will be open at Fault condition or low voltage.*

- ***4-20mA Current Output***:
The 4-20mA is isolated sink option.
The maximum permitted load resistor is 600Ohm.

STATE	20/20ML Output (mA)	20/20MU Output (mA)	To
FAULT	0	0	+0.5mA
BIT FAULT	2	2	±10%
NORMAL	4	4	±10%
IR Detect	8	-	±5%
UV Detect	12	-	±5%
WARNING	16	16	±5%
ALARM	20	20	±5%

- ***Communication Network***:
The detector is equipped with an RS-485 communication link that can be used in installations with computerized controllers. The communications protocol is Modbus compatible.
  - This protocol is a standard and widely used.
  - It enables continuous communication between a single standard Modbus controller (Master device) and a serial Network of up to 247 detectors.
  - It enables connection between different types of Spectrex detectors or other Modbus devices to the same Network.

5.2 Mechanical Specifications

A. Enclosure options

- St. St. 316L Electro chemical and passivation coating
- Plastic enclosure, glass fiber reinforced polyester

B. Water and dust tight

NEMA 250 type 6p.
IP 66 and IP 67 per EN 60529

C. Electronic Modules

Conformal coated.

D. Electrical connection (two options)

1. Connector Interface (mating connector supplied with detector)
2. Cable Interface

E. Dimensions

Base: 4.3 in (110mm) x 3.9 in (100 mm)
Height: 2.6 in (65.5mm)

F. Weight

St. St. 316L Housing	2.4 lb. (1.2 kg)
Plastic Housing	0.6 lb. (0.3 kg)
Tilt Mount	0.8 lb. (0.37 kg)

5.3 Environmental Specifications

- **High Temperature**
  Design to meet MIL-STD-810C, method 501.1 procedure II
  Operating temperature: +160 °F (+70 °C)
  Storage temperature: +185 °F (+85 °C)

- **Low Temperature**
  Design to meet MIL-STD-810C, method 502.1, procedure I
  Operating temperature: -40 °F (-40 °C)
  Storage temperature: -65 °F (-55 °C)

- **Humidity**
  Design to meet MIL-STD-810C, method 507.1, procedure IV
  Relative humidity of up to 95% for the operational temperature range.

- **Salt Fog**
  Design to meet MIL-STD-810C, method 509.1, procedure I
  Exposure to a 5% Salt Solution Fog for 48 hours.

- **Dust**
  Design to meet MIL-STD-810C, method 510.1, procedure I
  Exposure to a dust concentration of 0.3 frames/cubic ft. at a velocity of 1750 fpm, for 12 hours.

- **Vibration**
  Design to meet MIL-STD-810C, method 514.2, procedure VIII
  Vibration at an acceleration of 1.1g within the frequency range of 5-30 Hz, and an acceleration of 3g within the frequency range of 30-500 Hz.

- **Mechanical Shock**
  Design to meet MIL-STD-810C, method 516.2, procedure I
  Mechanical Shock of 30g half-sin wave, for 11 msec.

- **Electromagnetic Compatibility (EMC):**
  This product is in conformance with EMC directive 89/336/EC.

Radiated Emission	EN61000-6-3
Conducted Emission	EN61000-6-3
Radiated Immunity	EN61000-4-3
Conducted Immunity	EN61000-4-6
ESD	EN61000-4-2
Burst	EN61000-4-4
Surge	EN61000-4-5

6. Installation Instructions

6.1 Scope

The SharpEye Models 20/20ML and 20/20MU are a self-contained Optical Flame Detectors designed to operate as a stand-alone units, directly connected to alarm systems or automatic fire extinguishing systems. The detectors can be part of a more complex system where many detectors and other devices are integrated through a common control unit.
This Section does not attempt to cover all of the standard practices and codes of installation. Rather, it emphasizes specific points of consideration and provides some general rules for qualified personnel. Wherever applicable, special safety precautions are stressed.

6.2 General Considerations

Very Important

The detector should be aimed toward the center of the detection zone and have a completely unobstructed view of the protected area. Whenever possible, the detector face should be tilted down at a slight angle to prevent the accumulation of dust and dirt. Do not start an installation unless all conceivable considerations regarding detector location have been taken into account.

To ensure optimal performance and an efficient installation, the following guidelines should be considered:

A. **Sensitivity**
To determine the level of sensitivity, the following issues should be considered:
- Size of fire at determined distance to be detected.
- Type of flammable materials.

B. Spacing and Location
The number of detectors and their locations in the protected area are affected by:
- Size of the protected area
- Sensitivity of the detectors
- Obstructed lines of sight
- Cone of view of the detectors
- 20/20MU should not be used outdoors

C. Environment
- Dust, snow or rain can reduce the detectors sensitivity and require more maintenance activities.
- The presence of high intensity flickering of IR sources may affect sensitivity.

6.3 Preparation for Installation

Installation should comply with local codes or NFPA as applicable to flame detectors. The detectors can be installed with the use of general-purpose common tools and equipment.

1 Verify the appropriate Purchase Order. Record the Part No. and the Serial No. of the detectors and the installation date in the appropriate Log-book.

2 Open the container package prior to detector installation and visually inspect the detector.

3 Verify that all components required for the detector installation are readily available before commencing the installation. In case that the installation is not completed in a single session, secure and seal detectors and conduits.

4 For wiring, use color-coded conductors or suitable wire markings or labels. 12 to 20 AWG (0.5 mm² to 3.5 mm²) wires may be used for site wiring. The selection of wire gauge should be based on the number of detectors used on the same line and the distance from the control unit, in compliance with specifications.

6.4 Installation

The detector can be mounted directly on the wall through 7-mm hole (item 7, Fig. 6) or preferably with the optional Tilt Mount, Model 787640 (item 1, Fig. 6). The Tilt mount enables the detector to be rotated up to 60 degrees in all directions.

6.4.1 Tilt Mount Kit P/N 787639

Table 9: Tilt Kit

Item	Qty	Type/Model	Location
Tilt Mount	1	787640	
Screw	4	10-32 UNF x 7/16”	Detector - Holding plate
Spring Washer	4	No. 10	Detector - Holding plate

6.4.2 Tilt installation (Figs. No. 6 and 7)

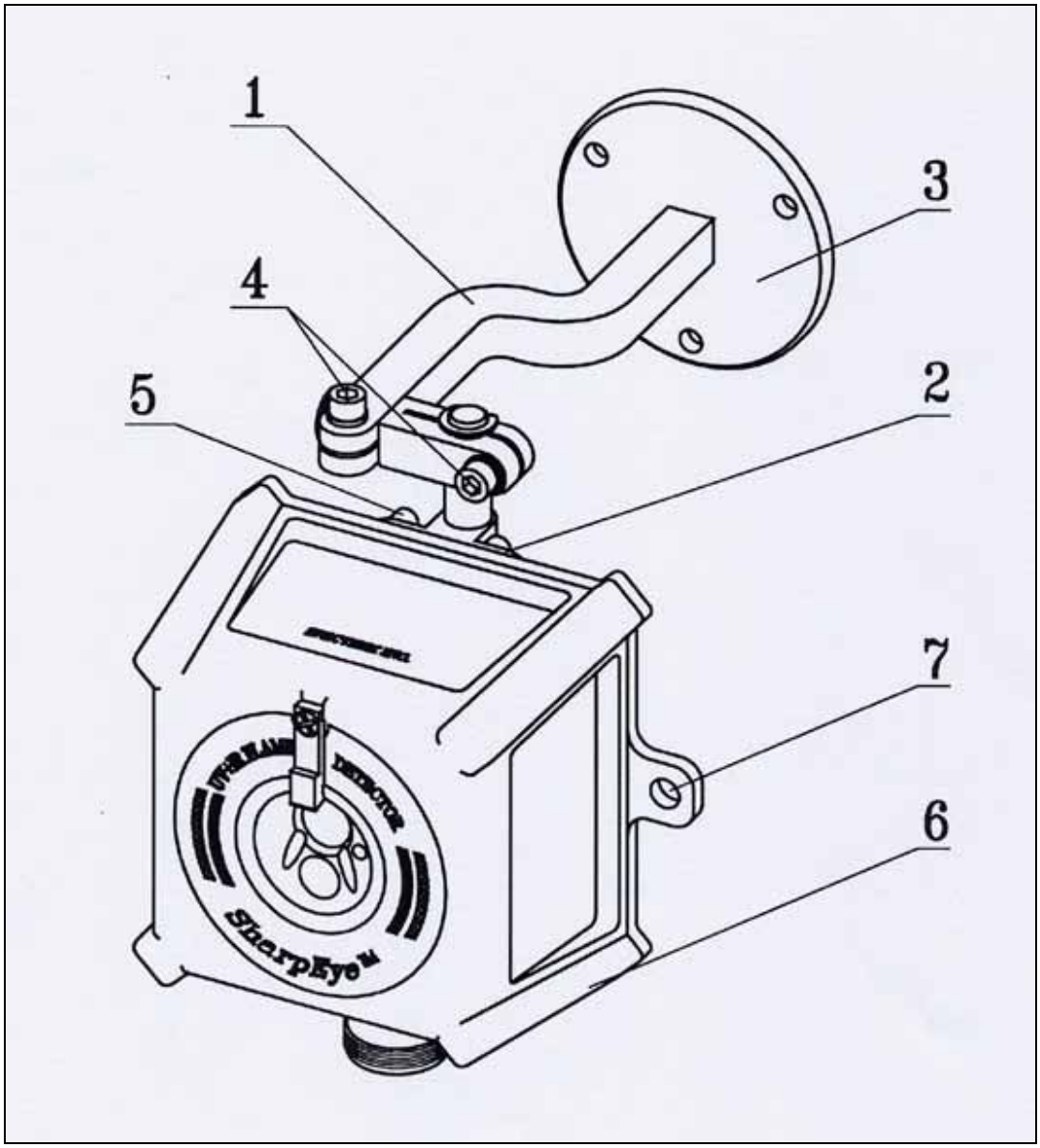
1 Place the tilt mount (item 1) in its designated location and secure it with three (3) fasteners through three (3) holes dia. 5.2mm (Fig. 7).Note: Skip this step if the Tilt Mount is already installed. Also detector removal for maintenance purpose does not require Tilt Mount removal.

2 Unpack the detector.

3 Place the detector, with its connector or cable pointing down, on the holding plate of the tilt mount (item 2). Secure the detector by four (4) 10-32 UNF x 7/16” screws with No. 10 spring washers to the Tilt Mount. Use 5/32 Hex Key for 10-32 screw (item 5).

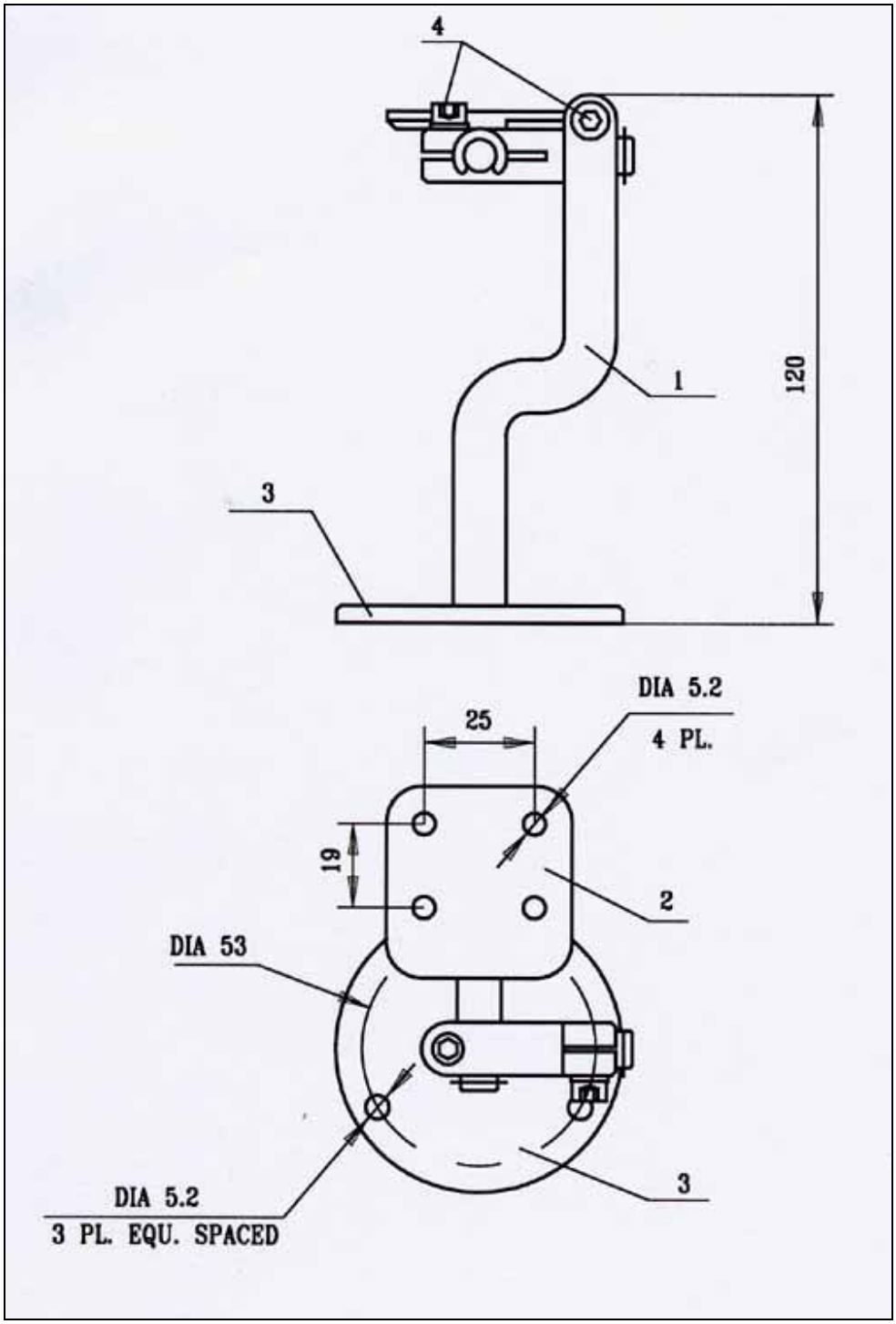
4 Release the locking screw (item 4) in such a way that allows rotating the detector. Point the detector towards the protected area and make certain that the view of the area is unobstructed. Secure the detector in that position by tightening the locking screws (item 4) on the tilt mount. (Make sure the detector is in the correct position.)

The detector is now correctly located, aligned and ready to be connected to the system.



Description			
1	Tilt Mount	5	Holding Screws
2	Detector Holding Plate	6	Washers
3	Mounting Plate	7	IR Detector Direct Mounting Holes
4	Locking Screw		

Figure 8: Detector and Tilt Mount Assembly



Description			
1	Tilt Mount	3	Mounting Plate
2	Detector Holding Plate	4	Locking Screw

Figure 9: Tilt Mount Assembly - Outline Drawing

6.5 Detector Mounting

These detectors are not approved for location in hazardous classified areas

A. Choose the wiring configuration according to Appendix A.

B. Connect the wire to the required PIN on the connector or choose the required color on the cable, according to your wiring diagram.

C. Connect the grounding wire to general screw outside the detector, (Figs.2 and 3). The detector must be well grounded to earth ground for proper operation.

6.6 Wiring Function

(See Fig. No. 8 and No.9.)
The following describes the function of each electrical wire of the detector:

Power Supply
PIN No. 1 or red wire -Input Power
PIN No. 2 or black wire - Return

Manual Bit Activation
PIN No. 11 or yellow wire - Manual BIT activation.
The manual BIT is initiated by a momentary connection of the 11 (yellow wire) to the power supply Return line.

Fault Relay
The Fault output is a N.C. SPST contact relay:
PIN No. 5 or brown wire
PIN No. 6 or light blue wire
The contact is normally energised closed when the detector is in its normal operational condition.

Alarm Relay
The Alarm output is a N.O. SPST contact relay.
PIN No. 7 or orange wire
PIN No. 8 or violet wire

4-20 mA Output
This output is used for analog, 4-20 mA current output as specified in Paragraph 5.1D
PIN No. 11 or pink wire - output (+).
PIN No.12 or blue wire -input (-)
See Appendix A for more details.

RS-485
This output is used for communication network as specified in Appendix A.
PIN No. 10 or white wire - positive (+) lead.
PIN No. 9 or gray wire - negative (-) lead.

Ground
Pin No. 12 or green wire - Ground connection.

6.7 Operation Mode

The detector is supplied with a default function set up (see table 8). The function set up can be reprogrammed by the user through RS-485 using a PC with Spectrex Host Software or through use of a handheld unit. Refer to TM 784050 for instructions.

Programmable Function:
Modes of operation are programmable with a PC or Handheld unit according to the selection table in Paragraph 4.3.2 and Refer to TM 784050.

Address:
The detector has the capability of acting as an addressable device.
The detector provides 247 (1-247) addresses, which can be used by the RS-485 communications link as described in paragraph 4.3.2 d - and Refer to TM 784050.

Alarm Delay:
An Alarm Delay may be required for certain applications. The detector has an Alarm Delay that permits time delays from 0, anti-flare, 3, 5, 10, 15, 20 and 30 seconds respectively. The delay can be defined by the RS-485.
Refer to TM784050.

7. Operating Instructions

7.1 Scope

The following instructions are designed to obtain optimal performance from the detector over its life cycle.

7.2 Power-Up

1 Apply power and wait approximately 60 seconds for the automatic self-test of the detector.

Note: Applying power initiates the following sequence:
- the LED flashes (4 Hz) yellow.
- BIT is executed, if successful then:
- LED flashes (1 Hz) green,
- FAULT relay contacts close

2 Wiring Inspection: If a short-circuit or line discontinuity exists, indications will appear on the control unit display panel. Review your wiring.

3 The detector goes into its FAULT state when supply voltage drops below 16.5V. The detector status goes back to NORMAL, when the supply voltage is above 17.5V.

4 Detector Inspection: Visually inspect the viewing window of the detector. It should be clean and clear.
- LED should flash (1 Hz) green
- ALARM relays should be N.O
- FAULT relay should be N.C
- The 4-20mA Output should be 4mA.

5 If any of the outputs or indications is different from the description in step 4, see paragraph 8.6 for troubleshooting.

The Flame Detector is now ready for Functional Testing.

7.3 Reset (only when optional 'latching' alarm has been selected)

To RESET a detector when in its ALARM state, disconnect power, or initiate a manual BIT.

7.4 Functional testing

Following is a testing procedure for proper functioning of the detector. The detector can be tested using the Manual Built-in-Test or the Spectrex Fire Simulator - 20/20-311

7.4.1 Manual BIT Test

Momentarily connecting PIN number 11 or yellow wire with PIN 2 or black wire performs manual BIT.

Important Note!
If the function setup "Alarm BIT" is at YES, then the Alarm and 4-20mA Output will be activated during a manual BIT Therefore, automatic extinguishing systems or any external devices that may be activated during BIT must be disconnected.

1 Verify that the detector is operating properly.

2 Initiate manual BIT. After a few seconds the following occurs:
- Alarm Relay will be activated and the 4-20mA output turns to 20mA for 3 seconds (only if "Alarm BIT" at YES).
- The LED should light constant red for 3 seconds.
- Fault Relay should stay N.O during the test.

7.4.2 Testing with Fire Simulator Model 20/20-311 (see Appendix B)

This test simulates an exposure of the detector to a real fire condition. The detector is exposed to radiation at the required detection level. As a result the detector must generate a Fire Alarm signal.

Important Note!
If the detector is exposed to a fire simulator, the Alarm Relay and 4-20mA will be activated during the simulation. Therefore, automatic extinguishing systems or any external devices, which may be activated during this process, must be disconnected.

1 Apply power to the system and wait up to 60 seconds for detector to turn to normal state and the LED flashes (1 Hz) green. If the detector is on, skip this step.

2 Aim the Spectrex Fire Simulator Model 20/20-311 at the target point of the detector (see Fig. 15), in a way that the radiation emitted by it is facing directly towards the detector. (See appendix B)

3 Press the operation button once. After few seconds,
- The LED should light steady red for a few seconds.
- The 4-20mA output should turn to 20mA for a few seconds and then return to 4mA.
- The Alarm Relay should also turn on during this period.

This completes the installation procedure. The detector and system are now ready for operation.

7.5 Safety Precautions

After Powering-up, the detector requires hardly any attention in order to function properly, but the following should be noted:

1 Follow the instructions in the manual and refer to the drawings and specifications issued by the manufacturer.

2 Do not expose the detector to radiation of any kind unless required for testing purposes.

3 Do not open the detector housing, while power is supplied.

4 Do not touch internal parts other than the three functional switches. Interference with internal circuits may impair detector performance and will invalidate manufacturer's Warranty.

5 Disconnect external devices, such as automatic extinguishing systems before carrying out any maintenance.

8. Maintenance Instructions

8.1 Scope

This Section deals with preventive maintenance, describes possible faults in detector operation and indicates corrective measures. Ignoring these instructions may cause problems with the detector and may invalidate the warranty. Whenever a unit requires service, please contact the manufacturer or its authorized distributor for assistance.

8.2 Maintenance Instrumentation and Personnel

Detector maintenance requires ordinary tools and suitably qualified personnel, who should be familiar with local codes and practices.

8.3 Preventive Maintenance Procedures

The detector must be kept as clean as possible. The detector's viewing window and the reflector must be cleaned periodically. The frequency of cleaning operations depends upon the environmental conditions and specific applications. The fire detection system designer will give his recommendations.

1 Disconnect power to the detector before proceeding with any maintenance including lens cleaning.

2 To clean the detector viewing window and reflector, use water and detergent then rinse with clean water.

3 Where dust, dirt or moisture accumulates on the window, first clean with a soft optical cloth and detergent then rinse with clean water.

8.4 Periodic Maintenance Procedures

In addition to preventive cleaning and maintenance, the detector should be functionally tested every six months. This test should also be carried out if, for any reason, the detector has been opened.

8.4.1 Power-Up Procedure

Perform Power-Up procedure every time power is restored to the system. Follow the instructions in paragraph 7.2.

8.4.2 Functional Test Procedure

Perform a functional test of the detector as described in paragraph 7.4.

8.5 Maintenance Records

It is recommended to record maintenance operations performed on a detector in a system Log-book. The record should include information, which identifies the unit, the installation date, contractor, and entries for every maintenance operation performed including the description of the operation, date and personnel ID. If a

unit is sent to the manufacturer or distributor for service, a copy of the Maintenance records should accompany it.

8.6 Troubleshooting

8.6.1 Fault Indication

1 Check power supply for correct voltage, polarity and wiring.

2 Check detector window and reflector for cleanliness. If necessary clean the window as indicated in paragraph 8.3 and repeat the test.

3 Disconnect the power supply to the system and check the detector's internal wiring.

4 Reconnect power supply and wait approximately 60 seconds. Repeat the test. If the indication LED is still flashing (4 Hz) yellow, the unit requires service.

8.6.2 False Alarm or Warning Indication

1 Disconnect the power supply from the system and check internal wiring.

2 Reconnect power supply and wait approximately 60 seconds. If indication remains, the unit requires service.

Appendix A: Typical Wiring Configurations

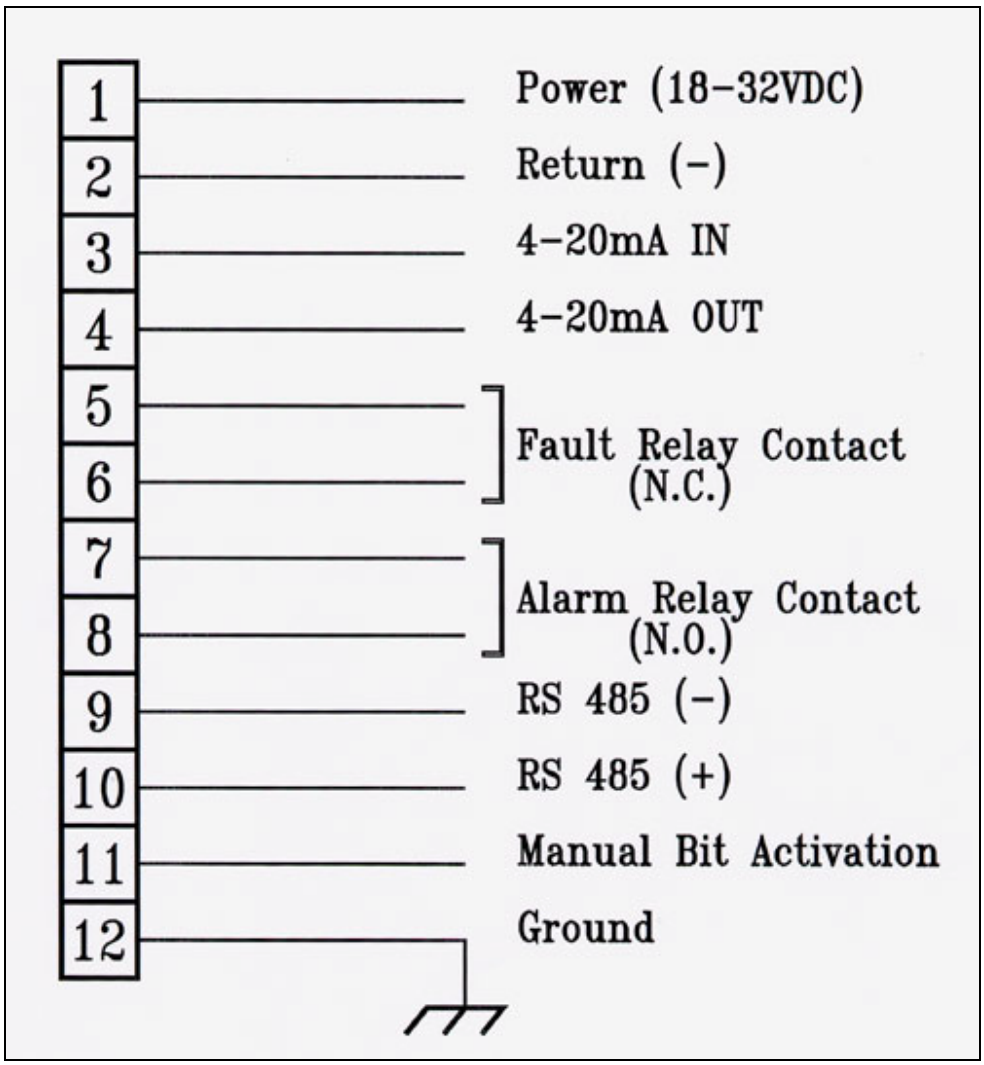


Figure 10: Connector Interface Option

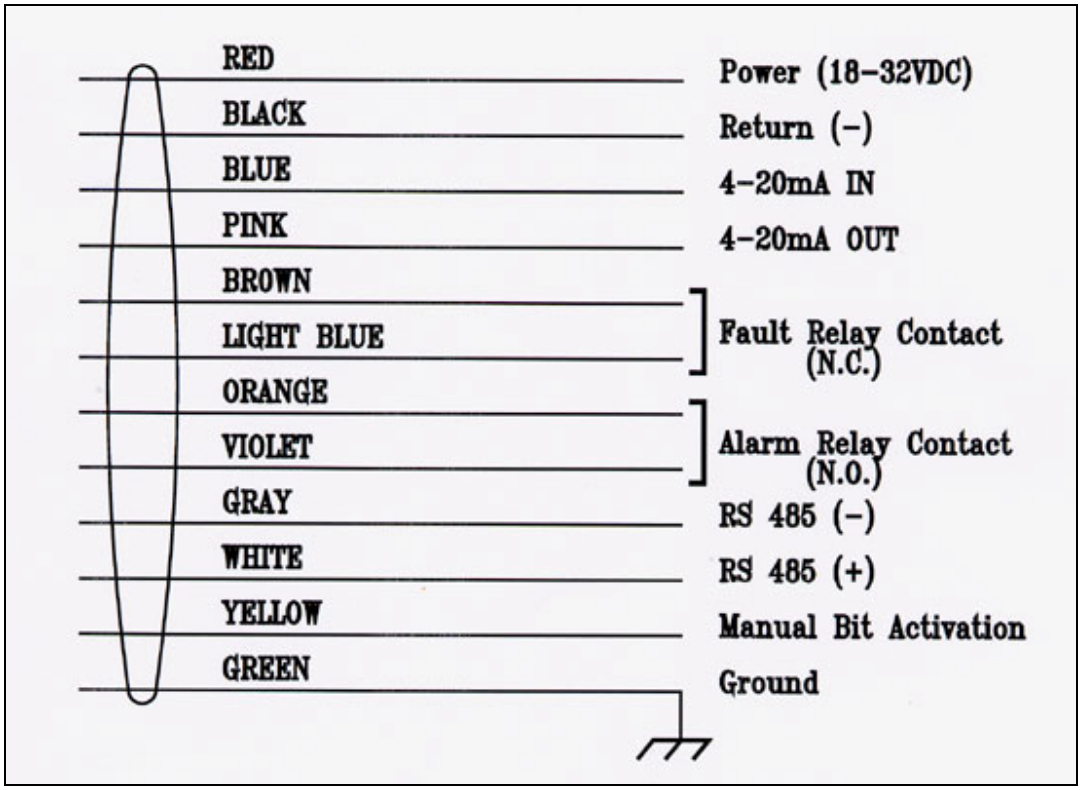


Figure 11: Cable Interface Option

RS-485 Communication Network

Using the RS-485 network capability of the IR detector and control software, it is possible to connect up to 32 detectors in an addressable system with 4 wires only (2 for power and 2 for communication). Using repeaters, the number of detectors can be much larger (32 detectors for each repeater) up to 247 on the same 4 wires. When using the RS-485 network, it is possible to read each detector status (FAULT, WARNING, ALARM) and to initiate a BIT to each detector individually.

For more details, consult the factory.

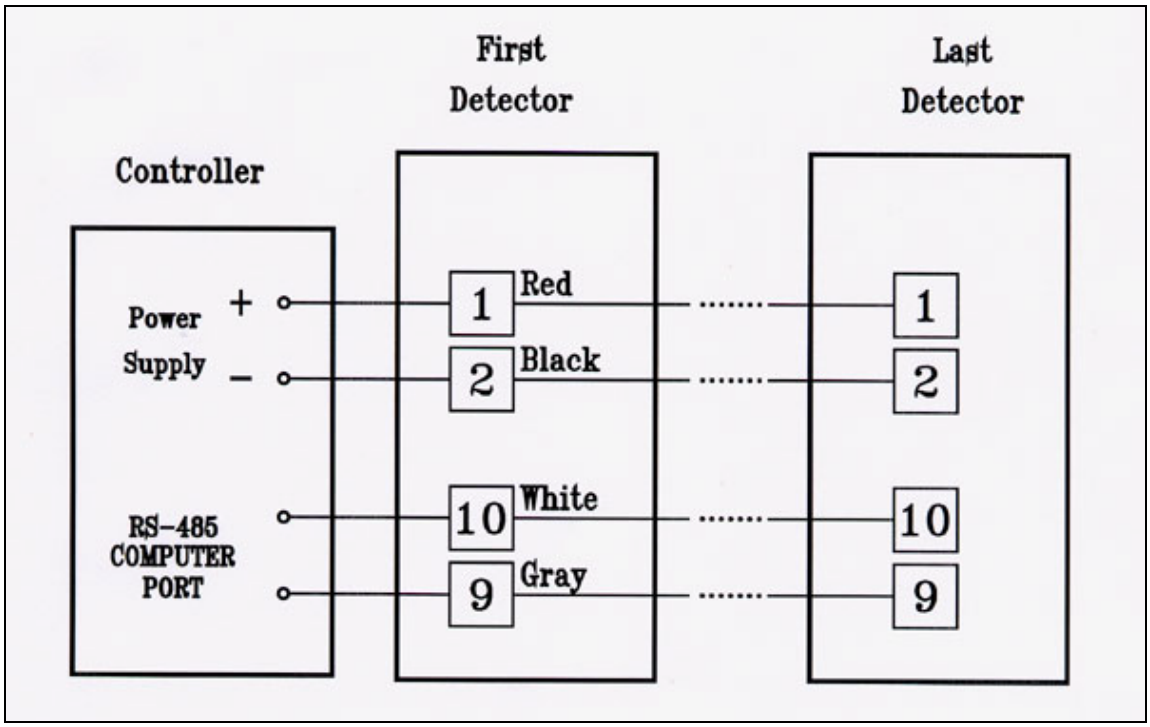


Figure 12: RS-485 Networking

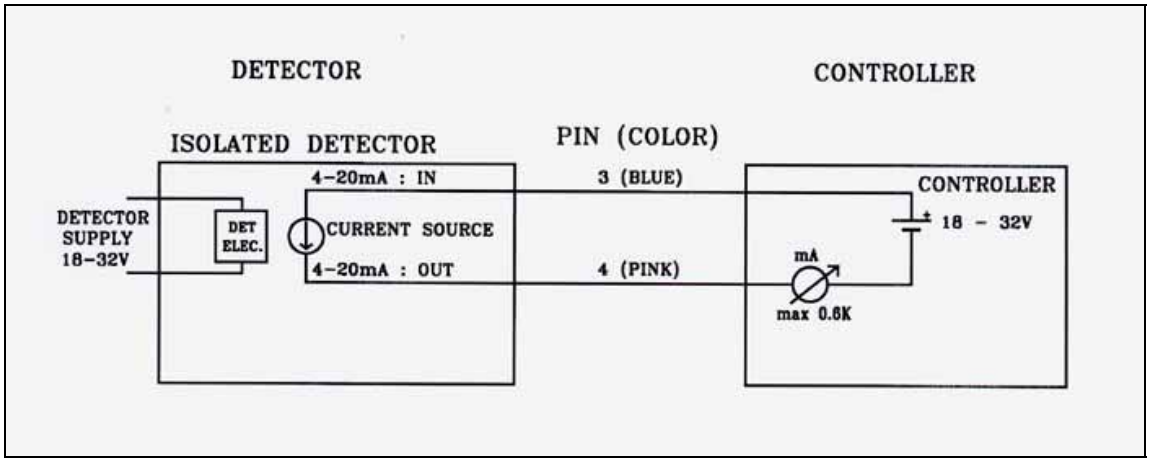


Figure 13: 4-20mA Wiring (Sink Option)

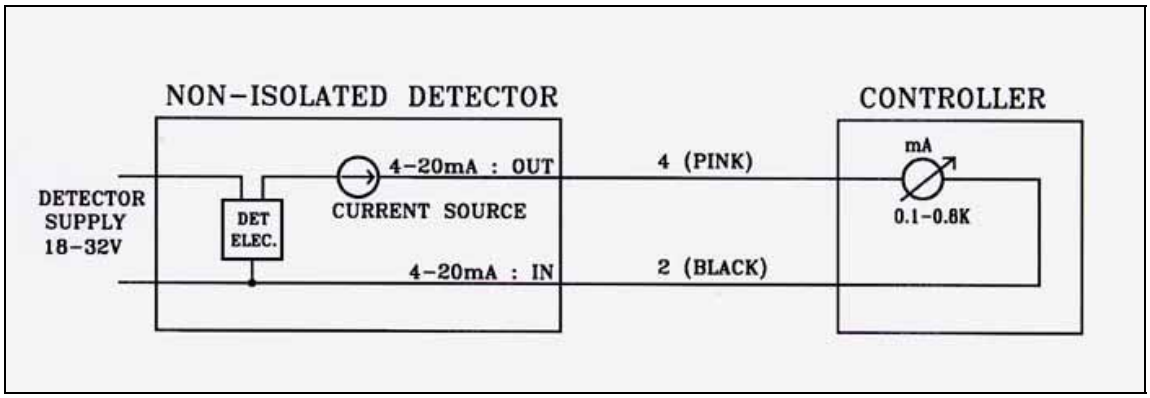


Figure 14: 4-20mA Wiring (Source Option)

Notes: The detectors are factory set to isolated 4-20mA-sink version.

To work at non-isolated 4-20mA source version, connect PIN 3 or blue wire to PIN 1 or red wire. This can be done on the mating connector or in the junction box in the cable option.

The 4-20mA will be measured between PIN 4 or pink wire and PIN 2 or black wire.

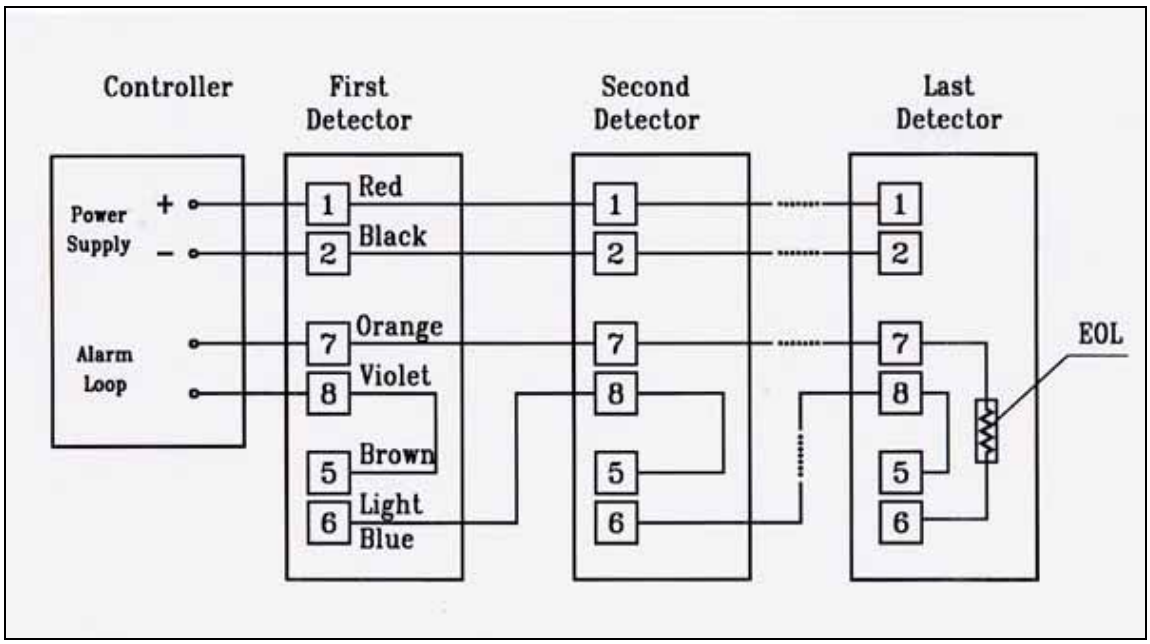


Figure 15: Typical Wiring For 4 Wire Controllers

Notes:

1 For EOL resistor value see Controller Manual
2 The color wire refers to the color of the cable output option. The PIN No. Refer to the connector option.

Appendix B: Long Range UV/IR Fire Simulator

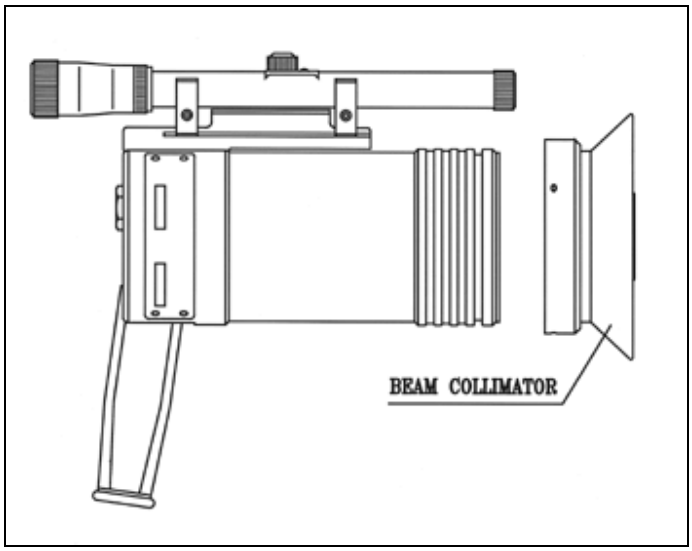


Figure 16: Fire Simulator

Product Description
The SharpEye UV/IR Long-Range Fire simulator 20/20-311 is designed specifically for use with the UV/IR or UV flame detectors. The Fire Simulator emits UV/IR radiation in a unique sequential pattern corresponding and recognizable by the detector as fire. This allows the detectors to be tested under real fire conditions without the associated risks of an open flame. There is a specially designed beam collimator (model number 20/20-190) used for extended range

Unpacking
In addition to the delivery form, there should be the following contents:

- Fire Simulator with built in batteries
- Battery charger
- Optional Beam Collimator
- Storage Case

Operating Instructions

Warning: Do not open the Fire Simulator to charge the batteries or for any other reason in a hazardous area.

Caution:
The following test will simulate a real fire condition and may activate the extinguishing system or other alarms. If this is not desired, disconnect them before the test and reconnect after the simulation.

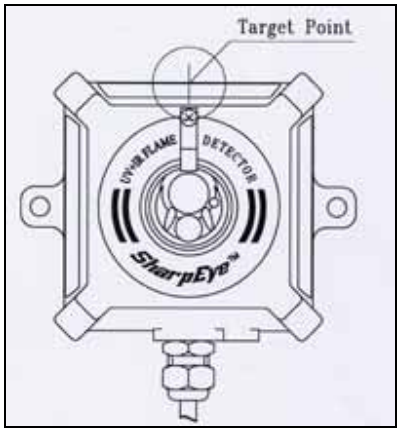


Figure 17: UV/IR Detector Target Point

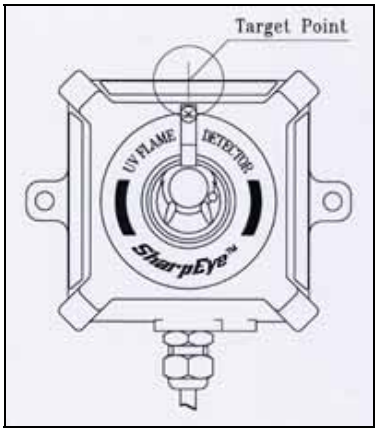


Figure 18: UV Detector Target Point

Follow these instructions to simulate a fire:

1 Aim the Fire Simulator towards the detector's "Target Point" (see Fig. 17-18)

2 For testing, keep a distance of at least 20 inches (50cm) from the detector.

3 Press the operation button once. Fire simulation will last for 20 seconds. The detector will send an alarm signal.

4 For another fire simulation a 20 second time lapse is required between tests.

5 Make sure the optical window is clean and keep the Fire Simulator in the storage case when not in use.

Battery Charging

1 The Fire Simulator uses NiCd batteries as a rechargeable power source. When the batteries are fully charged it will operate for at least 60 uses without recharging. An internal buzzer is sounded when the voltage from the batteries is lower than the required operational level.

2 Place the Fire Simulator into the storage case on a table in a safe area.

3 Turn the sealed plug (next to the operation button) counter clockwise with a suitable wrench.

4 Connect the battery charger.

5 Charge for a maximum of 14 hours.

6 Disconnect the charger.

7 Tighten the sealed plug clockwise.

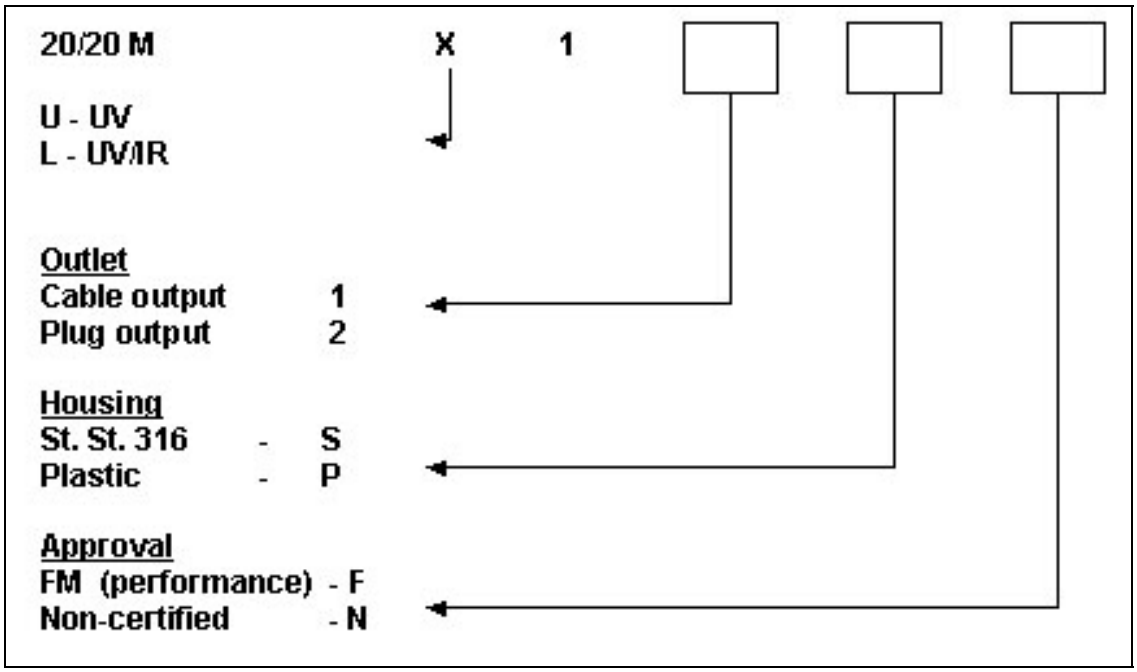
Specifications

Mechanical		
Explosion Proof Enclosure: NFPA (designed to meet) Class I, Division 1 & 2 Groups B, C and D Class II, Division 1 & 2 Groups E, F, and G ATEX EX II2G NEMKO 02ATEX255 EExd IIB T5 50˚C per En 50-014 & EN50-018		
Electrical		
Power:	8 VDC Max 6 x Rechargeable1.2 VDC NiCd Batteries	
Current:	2.5A Avg.	
Charge:	400mA for 14 Hours	
Environmental		
Temperature Range:	-4º F (-20º C) to 122º F (50º C)	
Vibration Protection:	1g (10-50hz)	
Water and Dust:	IP 67 per EN 60529	
Physical		
Dimension:	11.5 x 10.1 x 3.9 in (292 x 258 x 100 mm)	
Weight:	7.5 lb. (3.4 Kg)	
Range*		
Model	**Standard**	**Extended Range with optional Beam collimator**
20/20ML	14.5 ft (4.5m)	29 ft (9m)
20/20MU	14.5 ft (4.5m)	29 ft (9m)

* The minimum distance from the detector is 20 inches (50cm)
* At extreme temperatures 15% Max. Reduction

Appendix C: Ordering Information

Please define the requested model according to 1.1.5 by filling in the appropriate squares below.



The detector default set up:	20/20ML	20/20MU
Delay	A	3 sec
Alarm Latch	NO	NO
Automatic BIT	YES	YES
Alarm BIT	NO	NO

If you need a special set up, please refer to Section 3.2 to complete the following table:

SENSITIVITY	☐	ALARM LATCH	☐
DELAY	☐	AUTOMATIC BIT	☐
		ALARM BIT	☐

Orders may be sent to:
Spectrex Inc.
218 Little Falls Road
Cedar Grove, NJ 07009, USA
Fax: +1 (973) 239-7614
E-mail: Spectrex@spectrex-inc.com

Name				
Company				
Position				
Billing Address		Address		
	City	State	Zip	Country
Shipping Address		Address		
	City	State	Zip	Country
Phone	Country Code	Area Code	Number	
Fax	Country Code	Area Code	Number	
E-mail				

For additional information about ordering 20/20MR, please call Spectrex Inc. at: +1 (973) 239-8398.

Technical Support

For all technical assistance or support, contact:

SPECTREX INC.

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Cedar Grove, NJ 07009, USA

Tel: +1 (973) 239 8398
Fax: +1 (973) 239 7614
Email: spectrex@spectrex.net
Web-site: www.spectrex.net

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Email: deryk@spectrex.net